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MASTER OF MILITARY STUDIES

**RIGHT SIZING THE FORCE:
RESTRUCTURING THE MARINE LIGHT ATTACK HELICOPTER (HML/A)
SQUADRON TO BETTER MEET THE EMERGING THREAT**

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Executive Summary

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Thesis: To implement the Commandant's vision statement earnestly and leverage the increased performance capabilities of the modernized UH-1Y and AH-1Z helicopters, the Marine Corps must reevaluate the organizational structure of the Marine Light Attack Helicopter (HML/A) squadron in order to determine if the unit is best manned, trained, and equipped to meet the expectations of emerging threats and future requirements.

Discussion: Analysis of the current HML/A structure indicates that it does not capitalize on the performance gains afforded in the H-1 upgraded aircraft nor does it address the future demand for low end Medium Lift assault support. The existing HML/A structure traces its genesis directly to a demand spike for assault support escort following the early 1990s Desert Shield/Storm - First Gulf War. To meet the overall demand for H-1s and cover this escort shortfall, the original HML/A design (12 AHs and 12 UHs) was changed. Two principal factors to solving this escort shortfall were cost and performance. During this period, the Marine Corps was purchasing new Cobra helicopters to align the Reserve and Active Component HML/As - thus, Bell Helicopter had an open AH-1W Cobra production line. Technology limiting the legacy UH-1N Huey to the slowest Marine helicopter, it was not considered a suitable assault support escort asset without significant cost expenditures to improve performance. In 1993, the final ratio for Primary Aircraft Authorized (PAA) per HML/A was determined and remains: 18 AH-1Ws / 9 UH-1Ns. The "H-1 upgrades" program, a Huey and Cobra modernization effort, approved in the late 1990s recently began delivering operational aircraft. The first three UH-1Ys deployed in January 2009. This upgrades program provides overall improvements in speed, range, endurance, survivability and lethality for both the UH-1 and the AH-1. These strides in performance are creating considerable efficiencies in mission execution for every task assigned the HML/A to include that of assault support escort. Substantial synergy exists when flying a UH-1Y and an AH-1Z together by affording the section leader flexibility in completing any or all mission tasks expected of H-1s. Trained to similar standards, mutually supportive, and complementary in weapons, sensors and performance, the upgraded and armed utility helicopter paired with the upgraded attack helicopter offer the MAGTF Commander a responsive force multiplier and the Aviation Combat Element (ACE) a flexible, adaptable option in either armed escort, lift or fire support. Acting on the new efficiencies gained in this synergistic team, as well as proactively adjusting to the programmed changes in the Marine Aviation master asset roadmap, requires a critical evaluation of the current HML/A structure in order to best determine the optimal organization that provides for the common defense and our national security as we prepare for the emerging threat.

Conclusion: The Commandant's *Vision and Strategy 2025* calls for multi-capable forces to perform in a wide range of environments against an uncertain adversary. Restructuring the future HML/A (UH-1Y/AH-1Z configured) to best meet this vision demands a paradigm shift away from the existing 18AH/9 UH construct. With a new vision statement to follow and two upgraded helicopters to employ, several assumptions used in the 1991 formula creating the 18/9 makeup have been invalidated. Larger changes within the Marine Aviation roadmap also dictate adjusting to new demands. The synergy achieved through the complementary Y/Z section make it the optimal core fighting element to build the HML/A around demanding reevaluation of manning, training and equipping HML/A squadrons. The multi-capable Y/Z team efficiently accomplishes mission success, meets future demands, and most effectively achieves the Commandant's vision statement to address the unknown adversary in an uncertain environment.

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Preface

From 1997 to 2008, while serving in various flying billets, I had the opportunity to experience the breadth of tasks an HML/A squadron contributed to the whole of Marine Aviation, to the Marine Air Ground Task Force Commander, and to the individual warfighter. This research was an opportunity to fully examine HML/A mission requirements and highlight another way Marine Aviation should consider unit structure as the Marine Corps right sizes the force for future battles across the spectrum of military operations.

I am greatly indebted to three true professionals and personal friends: Jeff Smith, Scott Jensen, and David Akeley for their numerous reviews of my thesis work, their ideas, and their honest feedback. I also extend my sincere thanks to the faculty of the Marine Corps Command and Staff College and the Gray Research Center, who have provided outstanding support and learning opportunities while at the school.

Introduction

One impressive advantage of attending Marine Corps University's Command and Staff College resident course is the tremendous opportunity to hear distinguished guest speakers address the students. The fall of academic year 2008 was no exception with service and assistant service chief briefs as well as Joint Chief of Staff-level guest lecturers. Among the many and varied topics discussed, one common thread was consistent for each of these speakers and all were "on message" concerning the future vision of our national defense. The thread focused both inward and outward. That is, the message emphasized a vital need for current force structure reviews at all levels optimizing military capabilities in order to meet the future wide-range of proactive and reactive operations necessary to preserve national security against an unknown adversary. The Marine Commandant's Vision & Strategy 2025 document continues this "right sizing the force" and "leaner in equipment" message of active reform, emphasizing a "multicapable force" that is "properly sized" and "postured for hybrid threats" and is capable of operations against a "wide range of adversaries" and a "full range of contingencies."¹ To implement the Commandant's vision statement earnestly and leverage the increased performance capabilities of the modernized UH-1Y and AH-1Z helicopters, the Marine Corps must reevaluate the organizational structure of the Marine Light Attack Helicopter (HML/A) squadron in order to determine if the unit is best manned, trained, and equipped to meet the expectations of emerging threats and future requirements.

Background

The current organizational structure of the HML/A squadron includes a Primary Aircraft Authorized (PAA) total of 18 AH-1 "Cobra" helicopters, 9 UH-1 "Huey" helicopters, and all the associated support equipment necessary to perform organizational level maintenance activities. Personnel assigned includes: 67 pilots and 19 crew chiefs, a significant organizational level

maintenance department of over 350 personnel across 15 occupational skills, plus the traditional functional headquarters personnel (administration, intelligence, operations, logistics, communications, safety and standardization). The 67 pilots further divide down into 44 AH-1 pilots and 23 UH-1 pilots, all of various ranks from first lieutenant to lieutenant colonel.³

The squadron is normally employed as an integral part of an Aviation Combat Element (ACE). At present, the squadron may deploy as a complete unit, or more typically in three detachments consisting of six AH-1s and three UH-1s per detachment. With the January 2007, presidential approved 202k end strength, the Marine Corps planned number of Active Component (AC) HML/A squadrons increases from six to nine, while the Reserve Component (RC) numbers decrease from two squadrons to one. A single Fleet Replacement Squadron (FRS) exists to provide initial, conversion, or refresher training to Huey and Cobra pilots.⁴ In total, the HML/A community will have ten operational squadrons and one training command to fulfill its role within Marine Aviation. The mission of the HML/A is to support the MAGTF Commander by providing offensive air support, utility support, armed escort and airborne supporting arms coordination, day or night under all weather conditions during expeditionary, joint or combined operations² (See Appendix A for the list of mission essential tasks performed by the two different helicopters designed to accomplish this single-unit mission statement).

In an HML/A, the core tactical unit is the section and is made up of two aircraft, each acting as a separate maneuver element with the wingman providing cover/security for the lead aircraft. From the section, larger flights/formations are built using this same principle. A division is a formation comprised of three or four aircraft. A flight is a formation comprised of more than four aircraft. For a flight, division and section leaders assist the flight leader in controlling the formation and executing the mission. Still, the flight or division formation is built around the core element of the section. As threat levels increase, formation size would decrease, with the section being the

most maneuverable tactical element able to provide mutual support. The complementary characteristics in aircrew mix, mission training, configuration design, and weapon/sensor systems of the “Y” and “Z” lend tactically to the mixed section approach being the optimal fighting force for all-around HML/A support.

A unique opportunity presents itself to improve the overall mission effectiveness of the HML/A thus, earnestly implementing the Commandant’s vision on properly sizing the force to combat hybrid threats across the spectrum of military operations while maintaining a conventional capability.⁵ An “H-1 upgrades” program, begun in the late 1990s, has finally delivered its first operationally capable UH-1Y.⁶ The approved upgrades Program of Record (POR) initiated a remanufacture of the aging Bell UH-1N and AH-1W helicopter fleet, originally contracting to refurbish 100 UH-1s and 180 AH-1s in order to fill the HML/A PAA. The upgrades program boasted major life cycle cost savings by possessing 84 percent commonality in parts between the two new airframes.⁷ The program was modified in 2006 to “build new Y” Hueys versus remanufacturing them.⁸ This decision had two principle factors. First, building new “Y” as opposed to the original concept of tearing down and remanufacturing old aircraft presented an overall cost savings. Second, utility helicopter support to the operating forces was forecasted as a critical shortage when UH-1Ns began coming off flight lines with no immediate remanufactured UH-1Y backfills.

Recently, the program achieved approval for additional modifications to account for two more changes occurring since its original inception. First, to accommodate the 202K Marine Corps plan, the increase in overall HML/A squadrons within Marine Aviation has driven the demand for the total H-1 buy - to grow to 349 (126 Ys + 223 Zs).⁹ Second, with this additional expansion, the same “build new Y” argument of flight line shortages during the remanufacture process was used as justification for “build new Z” helicopters. The shortage in AH-1 availability, when a percentage of

AH-1Ws was away being remanufactured into AH-1Zs, had overall AH-1 helicopter average availability on the flight line as low as 12 Cobras per HML/A for an extended period.¹⁰

The unique opportunity previously mentioned lies in the open helicopter production line specifically for the “build new Y”. This new effort presents an opportunity for the Marine Corps that has not existed in over 30 years – to reexamine and conceivably increase overall numbers of the venerable multi-mission utility helicopter in the aviation inventory (See Appendix B and Appendix C for fact sheets on these two upgraded helicopters).

Historical Analysis of the HML/A “Structure”

Both the UH-1 and AH-1 trace their origin to 1955, when Bell Helicopter developed a military version of its Bell Model 204 for the U. S. Army. Originally named the HU-1A, it was eventually re-designated the UH-1A. The single-engine UH-1E Huey was the first variant used by the Marine Corps and saw extensive action in Vietnam from the mid-1960s until the end of the conflict. The multi-mission capable or utility nature of this light helicopter expanded its role from mere troop transport to several other missions such as casualty evacuation, armed reconnaissance, Forward Air Control (Airborne) (FAC(A)), radio relay, and electronic warfare. As fire power capabilities matured, ground attack and helicopter escort missions joined the extensive list of mission tasks performed. The single-engine AH-1G Army model Cobra was born out of the UH-1E design and served as the Marine Corps’ first attack helicopter in the late 1960s. The AH-1G shared an extensive list of common parts in addition to using the same engine and rotor system design as the UH-1E. Its primary function was helicopter escort, but performed close air support and anti-armor missions, too.

Following final testing in 1969 for a twin-engine variant, the Marine Corps upgraded from the UH-1E to the twin engine UH-1N. The UH-1N production line at Bell Helicopter closed in 1977 and the Marine utility helicopter inventory numbered near 100.¹¹ Preserving a significant

percentage of identical engine, power train, rotor and flight control system parts in the H-1 line, the twin-engine "N" design was also present in the early 1970s production of the AH-1J model Cobra.

Improvements in anti-armor weapons capabilities by the U. S. Army during the late 1970s eventually led to the Marine Corps upgrading the engine, transmission, rotor and weapons systems of the AH-1 to support the Marine use of the improved Tube-launched Optically-tracked Wire-guided (TOW) missile. This new series attack helicopter was designated the AH-1T. It initiated the departure of parts and performance compatibility with the UH-1N.¹² In the early 1980s, incremental improvements to the TOW-2 missile, as well as some additional airframes upgrades to the AH-1T, led to another configuration version change to the AH-1T+.¹³ More technological advances in the mid-1980s on anti-armor weapons, in the form of the Hellfire laser guided missile and the air-to-air Sidewinder missile, required a stronger attack helicopter to carry them; thus, the AH-1 received another large funding expenditure for major engine, transmission and fire control systems upgrades, resulting in the Marine Corps taking delivery of its first AH-1W Super Cobra in 1986.¹⁴ Advances in weapons technology again provided justification for additional funding in the early 1990s to improve the fire control systems of the attack helicopter, thereby improving night targeting and laser designation capabilities for an incremental name change to AH-1W NTS¹⁵ (See Appendix D for the H-1 evolution).

The "HML/A" squadron designation was adopted when the Marine Helicopter Light (HML) and the Marine Helicopter Attack (HMA) squadrons permanently combined starting in April of 1986. A transition from OV-10 "Bronco" VMO squadrons to Light Helicopter squadrons started in 1968 as the UH-1E was incorporated into Marine Aviation as a multi-purpose gunship performing many of the reconnaissance and Forward Air Controller (Airborne) functions of the Bronco. Each of the three AC HML squadrons operated 24 Hueys and all HML units, active and reserve, transitioned from the UH-1E to the UH-1N by the end of 1977.¹⁶ HMA squadrons were activated

in the early 1970s, as the Marine Corps began fielding AH-1J Cobras in stand-alone squadrons. Each of the three AC HMAs had a PAA of 24 attack helicopters. Manpower, personnel, and organizational support equipment cost-saving efforts led to the HML/A composite squadron strategy decision in mid-1984 in an effort to capitalize on familiar maintenance practices being conducted on the two Bell helicopter products.¹⁷ Additionally, overlaps in the mission capabilities of reconnaissance, fire support, and forward air controller (airborne) promoted an H-1 team concept. April 1st 1986, after receiving its 12 AH-1Js, HML-167 was officially re-designated HML/A-167, becoming the first Marine Light Attack Helicopter squadron. As part of this transition, HML/A-167 transferred 12 of its 24 UH-1Ns to meet the established HML/A PAA of 12/12. By 1987, the three active component HMLs and HMAs had completed the transition to form six 12 AH / 12 UH HML/A squadrons.¹⁸

Later on in 1991, an after action item from combat operations in the First Gulf War made a significant impact on the HML/A structure. An inadequate level of assault support escort capability within I MEF during Desert Storm served as the catalyst for change. Specifically, the ACE experienced a shortage of available assault support escort assets during planning for battalion sized or larger helicopter borne operations. Not seen as a viable helicopter escort platform due to maximum airspeed limitations, staff planners disregarded the Hueys as a helicopter escort asset, increasing the demand for the faster AH-1s.¹⁹ The competing demands of Cobras conducting anti-armor missions against performing assault support escort missions produced a shortfall with the limited number of AH-1s in theater. Conversely, dismissed from the assault support escort role, the Hueys, with great success, continued to conduct reconnaissance, utility support, surface force escort, close air support, and forward air controller (airborne) missions throughout the rest of the combat operations.²⁰

Post Gulf War analysis, through various professional studies and cost comparison estimates both internal to Marine Aviation and within the department of the Navy, concluded that the only fiscally practical solution to the demand spike in assault support escort capability was to increase the number of AH-1Ws.²¹ As a result of this decision, the HML/A organization was restructured with people and assets into what is seen today. Three key planning factors in this decision were schedule, performance, and cost. Bell Helicopter's AH-1W production line was still in operation, providing contracted delivery of new AH-1Ws bought to replace RC AH-1Js and adjust for higher than planned attrition rates.²² A contract modification to increase the overall delivery number met the shortest scheduling horizon to cover the increased H-1 demand. Relative to other Marine helicopters, the UH-1N's speed performance, in its 1970 configuration, did not adequately address the H-1 demand spike in assault support escort coverage. The cost to reengineer and restart the UH-1N production line was a cost prohibitive option. Based on these considerations, the fiscally realistic solution to equip the six active and two reserve HML/As was to spread the remaining UH-1Ns in the inventory and increase the number of AH-1W Cobras to an amount that met the threshold requirement for overall H-1 support within Marine Aviation.²³ In mathematical terms, the UH-1N was the constant, the AH-1W was the variable, and by adding them, the total had to equal the overall H-1 demand.

The foundation used to solve this overall H-1 demand equation was built around the HML/A structure being designed to support three equal and independent detachments. Shifting the final makeup from the 12AH / 12UH PAA to meet the overall H-1 demand took into account several planning considerations, as well as worldwide future threat assessment scenarios. One key consideration used to compute detachment aircraft quantities centered on empirical data relating to aircraft availability. These availability numbers were based on average maintenance man-hours versus flight hours for H-1s as well as overall mission capable/readiness ratios. Mapping future

Mapping future threat analysis data against the mission tasks (See Appendix E) performed by each helicopter produced the statistical sortie requirements for an HML/A detachment to generate. In short, H-1s flying sustained sortie rates with historical daily mission capable H-1 helicopter availability at 70 percent required a detachment to fly 15 sorties (10 AH + 5 UH). To fly the 15 sorties in a 24-hour period with 70 percent of the aircraft available for tasking required 6 Cobras and 3 Hueys. This formula translated directly to a full squadron flying three times those sorties at the same 70 percent aircraft available rate. Consequently, this equation resulted in the existing per squadron PAA: 18 AH-1Ws / 9 UH-1Ns, structured to field three detachments of 6/3.²⁴ (See Appendix E for additional details and planning factors).

Mission Analysis and the HML/A "Process"

Lessons re-learned during these Gulf War combat missions, and later contingency and combat operations, often resulted in Huey and Cobra pilots combining efforts/assets to capitalize on the strengths and complementary systems of each aircraft within the squadron.²⁵ The "mixed section" style of fighting was not a new tactic. This mixed platform concept for helicopters dated back to Vietnam, both in the Marine Corps and the U.S. Army. Phrases, such as Pink-Team tactics, TOW-Team tactics, Hunter-Killer teams, and T-Bone tactics, have been used to describe this often used mixed airframe approach for tactical employment. This Huey/Cobra team's chief purpose being to capitalize on tactical efficiency gained through complementary systems and capabilities.²⁶ The combining of dissimilar aircraft to achieve synergy in mission execution for these mixed teams produced substantial results under various scenarios. The mixture and quantity of weapons/munitions carried and the useful payload of the Huey were environment, threat, and mission tasking dependant, with emphasis towards capitalizing on the strengths of each platform to make a multi-capable team.

The modernized Huey and Cobra create a substantial improvement in the capacity and the efficiency to perform their respective mission tasking. In the case of the UH-1Y, its upgraded engine, drive train, and rotor system has had a significant improvement in capability and payload.²⁷ Payload in this sense is defined as the weight available to perform mission tasking after accounting for aircrew and aircraft configuration weight factors. For example, a UH-1N would typically have a payload of approximately 800 pounds after configuring the base aircraft with mission fuel, mission weapons and ammunition and the four-man crew. The upgraded "Y" payload, after adding mission fuel, mission weapons and ammunition plus the four-man crew, is in excess of 2,200 pounds and could be well over 3,000 pounds if tradeoffs were made in fuel, weapons, or crew. Although going from the 13-seat "N" cabin option to the 10-seat "Y" configuration appears as a decrease in capacity, the increased performance makes the likelihood of actually getting airborne with those seats filled by 240 pound combat equipped Marines a tactical reality in the UH-1Y. This increase in payload also permits the UH-1Y even more configuration options to execute a very wide range of utility mission profiles either simultaneously or sequentially – heavily armed for fire support profiles, lightly armed for assault support profiles, or any combination thereof. Making this sizeable increase possible was primarily the integration of the new four bladed rotor system driven by the block upgraded engine pack producing twice the shaft horse power when comparing the "N" to "Y".²⁸

The speed differential from the two-bladed "N" to the four-bladed "Y" exceeds 60 knots. Mission cruising speed for the "N" typically averages 100 knots and holds approximately 1.3 hours of internal fuel, which gives it a planned mission range of 60 nautical miles. The "Y" improved these data points across the board, traveling at a long-range cruising speed of 135 knots and reaching a range of 130 nautical miles on its two hours of internal fuel. Velocity Never to Exceed, or Vne, on the "N" was aerodynamically limited to 130 knots whereas the "Y" has a Vne of 198

knots.²⁹ This flight envelope increase allows far more aggressive flight profiles, translating directly to increased lethality and aircraft survivability on the battlefield.

Upgrades from the AH-1W to the AH-1Z are not quite as dramatic in terms of percentages but do provide considerable improvements in speed, range, endurance, lethality, and survivability as well as returning to the commonality with the "Y" that the UH-1N and the AH-1J shared in the early 1970s. The various mission speeds, the range and the endurance profile of the "Z" are comparable to the UH-1Y. One of the biggest gains in the "Z" comes in lethality, moving from the four wing stations on the "W" to six stations (4 universal + 2 dedicated AIM-9 Sidewinder stations). The newly designed wing combined with the increase in overall aircraft payload allows the "Z" to increase its weapons quantities, carrying up to 16 Hellfire anti-tank missiles.³⁰ The "Z" does not incorporate fire control capability for the TOW missile making the laser guided Hellfire missile the only precision guided anti-tank weapon carried. Another lethality gain is the transition from the AH-1W's Night Targeting System (NTS) to the Lockheed Martin Target Sighting System (TSS) which will provide among other improvements, a third generation forward looking infra-red sensor.³¹ Effectively, the "Z" can carry twice the ordnance payload as the "W" and range the same distance or carry the same ordnance load as the "W" and travel twice as far³² (See Appendix B and Appendix C for additional performance comparisons).

The successful H-1 upgrades program has not changed the mission of the HML/A, nor has it substantially changed the essential tasks each aircraft is expected to perform within Marine Aviation for either the MAGTF or Joint Commander.³³ What has changed relating to the mission is the degree of efficiency and lethality to which these upgraded aircraft can perform those specified tasks and accomplish the overall HML/A mission. The significant efficiencies gained with these two modernized helicopters are being marginalized by an insular, status quo mentality resisting change to the institution (Appendix A provides the Mission Essential Task List (METL) for each aircraft).

Within Appendix A, Universal Joint Task List (UJTL) task numbers reference the tasking numbers from the Chairman of the Joint Chiefs of Staff Manual 3500.4C master requirements task list.³⁴ The tasks detailed for each helicopter are in concert with the overall HML/A mission statement and justify Hueys and Cobras existing in Marine Aviation. The UH-1 column identifies 12 overall tasks with 21 total items for execution. The AH-1 column identifies 13 overall tasks with 18 total items for execution. Of note, when reading this appendix, several identical tasks exist. Emphasizing each task item is trained to the same standard within the HML/A squadron and the upgraded “Y” and “Z” perform all these tasks with increased efficiency and effectiveness, the UH-1 can perform 15 of the 18 task items on the AH-1 METL or 83 percent crossover. Conversely, AH-1 crews train to perform 15 of the 21 task items of the UH-1 METLs or 71 percent common. Together, one UH-1 and one AH-1 can perform all 24 items listed in the METLs. Hence, the synergy, or complementary nature of skid mixed sections would appear to be the most advantageous composition for the preponderance of missions tasked to the HML/A. Mixed, in this context, defined as made up of both AH-1s and UH-1s, making the “skid mixed section” a 1-Huey/1-Cobra team .

This complementary character comes from both the physical and practical designs of the two airframes. The “Y” combines its four-man crew with state of the art target sensor/laser designator, a robust communications package, and an open cabin for a plethora of mission options. A four man crew provides 360° visual coverage armed with responsive, high volume offensive or defensive door mounted machine guns and nearly 360° weapons coverage. In addition, a fixed forward gun option and forward firing rocket capacity substantially expand firepower options. Team this crew and machine with the world’s premiere attack helicopter, its two-man crew, and its varied arsenal designed mainly for forward ordnance delivery, with a 20mm cannon slewing to just over 90° left or right when needed, makes the Y/Z combination a solid hunter – killer or “two fisted” fighting team.

Using the Commandant's "two fisted fighter" metaphor, the Y/Z mixed section provides an in-close, quick jab with the "Y" while able to deliver a knockout blow with the "Z" the moment an opening appears.

However, the increased capabilities of the Y/Z mixed section and the diverse nature of future operational environments requires a shift from the habitually narrow Phase 3, kinetic, firepower HML/A paradigm. Reevaluating the organizational structure must expand to include the broader construct described in the *Vision and Strategy 2025* plan.³⁵ An HML/A is capable of accomplishing tasks within all six functions of Marine Aviation. Structuring these squadrons or detachments around a core Y/Z team would right size the force for the emerging threat in an unknown environment that may require more than just a firepower response.

This Y/Z section provides the ideal core element for both mobility and lethality at the tactical level, while offering an extremely flexible force option at the operational level to address a wider array of response options. This team provides the most advantageous posture to have in the characteristic scenario where helicopters are initially launched to perform a planned mission and operational level circumstances change requiring execution of other higher priority tasking. The multi-capable force present in the mixed H-1 section is uniquely qualified to quickly shift and execute any of those twenty-four mission essential tasks. Scalable with the inherent ability to rapidly task organize, an HML/A squadron manned, trained and equipped around the core element of a Y/Z team is precisely what the tactical and operational commanders require of H-1s within the six functions of Marine Aviation.³⁶ Tactical considerations, with operational level implications, for the Y/Z team performing tasks within these six functions are detailed in Appendix F.

Cost as an Independent Variable Analysis

The H-1 upgrades acquisition program of record is in place to provide fielding for both the UH-1Y and the AH-1Z, which boasts 84 percent commonality. Because this program of record is a

single procurement plan, it ties together all costs to produce and procure the two separate airframes. As previously discussed, the program originally contracted 100 UH-1Ys and 180 AH-1Zs and was recently modified to accommodate the 202k plan resulting in 123 Ys and 226 Zs for a 349 H-1 procurement requirement. According to the 2008 FY09 DoD budget Program Acquisition Cost by Weapon, the procurement expenditure to purchase 20 H-1s in FY09 was 474.1 million dollars, translating to 23.705 million dollars per unit cost for the H-1.³⁷

While 84 percent common, part of the 16 percent that is not common between these two airframes is the AH-1Z's Target Sight System (TSS).³⁸ In a public statement released 28 March, 2008, the Department of Defense announced a contract award to Lockheed Martin Missile and Fire Control, Orlando, Florida for the production of 16 Target Sight Systems in the amount of \$49,989,104.³⁹ Unique to the AH-1Z, this creates a 3.1 million dollar per copy cost differential comparing the Huey to the Cobra. This system, combined with less significant but AH-1Y unique hardware and software expenses, required to support the fire control and environmental control systems in the world's premiere attack helicopter creates a noticeable cost differential between procuring a "Z" and procuring a "Y". Additionally, assuming the more complex (i.e., mechanical, technical, and software) systems essential in the AH-1Z would require additional degrees of organizational and depot level maintenance attention when compared to the UH-1Y, any changes to the current ratio makeup of the 349 total H-1 buy that lean towards more utility versus attack assets would result in measureable cost savings. This savings comes in terms of upfront procurement savings per airframe, as well as long term operational and maintenance funding to the lifecycle cost of the H-1 upgrades program.

Continuing cost analysis and comparing the UH-1Y against a near peer competitor for assault support, FY09 total procurement expenditure on the MV-22 was 2,220.4 million dollars for 30 Ospreys.⁴⁰ At 74.013 million per copy, the Osprey per unit procurement cost is more than three

times that of an H-1 at 23.705 million. Jet fuel consumption for per flight hour for the MV-22 is consistently twice that of the Huey during normal enroute profiles. When operating in conversion, or helicopter mode, the MV-22 fuel burn rate more than triples that of the UH-1Y requiring 3600 pounds of fuel per hour compared to 1000 pounds per hour fuel burn rates for the "Y".⁴¹

Another operating cost comparison is Maintenance Man-Hours Per Flight Hour (MMPFH). The MV-22 program MMPFH threshold level is targeted to be less than 20 maintenance hours for every flight hour logged with 2 of the 4 operational squadrons currently meeting that threshold. In contrast, the H-1 program threshold is set at 2.9 maintenance man hours per flight hour with demonstrated performance in its limited flight hour accumulation reaching 2.5 maintenance hours for every flight hour flown.⁴²

Results of this cost analysis are clear. A UH-1Y costs significantly less to procure and is more efficient to operate both in terms of fuel cost per flight hour and maintenance man hours required for each hour flown when compared head to head to the Osprey. Comparing the capabilities and unique characteristics of the Osprey to a UH-1Y is not the intent. However, cost comparison is relevant given certain constraints/restraints and when considering optimal asset allocations for set mission tasking.

Forecasting The Next Demand Spike Analysis

This place is crying for light lift (recon / small unit team insert), FAC(A), C&C/leader's recon, and to some extent low CDE ordnance (7.62/.50 cal). The EF early warning network is advanced, and being able to insert/extract a patrol in some of the outlining areas/villages would be huge! Also, getting timely medevac/casevac has been an issue. Having an indigenous capability with the UH-1Y again would be huge.

-- Major Victor Argobright, AH-1W pilot currently forward deployed to Afgh.

Beyond financial cost as an independent variable but realizing the fiscally constrained environment looming on the national defense budget horizon, and studying the FY2009 Marine Aviation Plan transition roadmap, predicting the next demand signal becomes easy. It relates directly to the MV-22.⁴³ The one for one transition in Medium Lift assets from the CH-46E to the

MV-22 has brought a substantial increase in capability to the MAGTF. This transition however, will produce a significant rise in cost to accomplish the lower end of the Medium Lift assault support tasking when compared to the former CH-46E costing model.

Cost in this context not only represents financial burdens, but also acceptable risk versus gain decisions when deciding which assault support asset is optimal for a given situation. Using the existing model for assault support mission aircraft with a UH-1, CH-46E, MV-22, and CH-53D/E helicopter force, the UH-1N was cost effective and tactically suitable in Light Lift, covering the 1-4 passenger/cargo up to 1,000-pound movements within a set flying range. The CH-46E provided the Medium Lift coverage overlapping and extending these numbers to upwards of 12 passengers/cargo to 4,200 pounds based on environmental conditions with the CH-53D and "E" series helicopters providing all the heavy lifting. The tremendous increase in performance and capability of the MV-22 over its predecessor, the CH-46E, permits the Osprey to influence and expand the traditional Medium Lift domain. Appendix G provides a visual representation for nominal passenger and cargo comparisons among these assault support assets.

Screening Appendix G with careful consideration towards removal of CH-46E assets gives reason to reflect on possible implications and indicates where the next demand signal will occur. How does this overall ripple effect impact the HML/A? With the UH-1Y's increased performance characteristics, the upgraded Huey now provides an efficient alternative to operate further into the lower end of the traditional Medium Lift arena. The lower end Medium Lift spectrum in this context is defined as the troop transport numbers in the 4-8 range and/or cargo in the 1,000-3,000 pound range and represents a considerable portion of a typical CH-46E squadron's tasking both in peace time and combat operations. This mission area comprised nearly 70 percent of the sorties flown during one Marine Medium Helicopter (HMM) squadron's seven month Operation Iraqi

Freedom tour.⁴⁴ Considered another way, the previously established Light Lift window has more than doubled in scope with the UH-1Y joining the assault support asset inventory.

Acknowledging the large quantity of these high-demand/low-density lower end Medium Lift mission requirements exist, the prime assets available in the Marine Aviation master roadmap to perform them will be either the UH-1Y or the MV-22. If significant distance and airspeed are the principle discriminators, the MV-22 is the suitable asset to put towards these lower end Medium Lift missions. Time critical casualty evacuations from a secure forward operating base to a specialized trauma unit several hundred miles away would be a classic example where the MV-22 is absolutely justified in moving small numbers of personnel. In contrast, a casualty evacuation from point of injury in a volatile area to a trauma unit in relatively close proximity would not be as clearly justifiable for risking an MV-22 over a UH-1Y. One significant factor in deciding which airframe would best support this mission is cost. Using the term cost in this sense involves risk assessment as well as financial considerations.

The intangible cost of risk must be assessed with an appreciation for the potential impact on strategic objectives if an MV-22 were lost. Is the risk of bringing the high valued, lightly defended MV-22 asset into a hostile area where the agile, heavily armed UH-1Y could achieve the same results? This illustration assumes the benefits of tilt-rotor technology (MV-22 speed and range) are negated by the scenario where the UH-1Y could reach the objective as quickly. Factor in the mixed section strengths previously covered and the Y/Z team provides a tactically sound solution in terms of cost, survivability, and overall risk for this and many other scenarios where Light Lift is appropriate. Modify the situation from a casualty evacuation to any number of troop or cargo transport missions or support flights where extended ranges or time critical consequences are not decisive factors and it is evident that the demands of the UH-1Y to perform more assault support operations shall increase.

Comparing the cost factor of these two options does include monetary aspects as well. That is, overall procurement cost of one MV-22 versus one UH-1Y plus operating cost per flight hour for each results in the UH-1Y being the fiscally responsible option for most low-end Medium Lift missions where tilt-rotor technology does not add value. Thus, this demand signal must be met through an increase in the supply of UH-1Ys in the operational inventory. Hence, the unique opportunity Marine Aviation must capitalize on with the “build new Y”.

Captain Matthew Crouch addresses this overall loss in cost effective medium lift capacity following MV-22 fielding, as well as the significant shortfall that exists in the current UH-1Y procurement plan, in his November 2007 *Marine Corps Gazette* article, “The Future of Medium Lift.”⁴⁵ His principle solution focused on procuring an entirely new additional lift asset to fill this Medium Lift assault support gap while keeping a smaller number of MV-22s. A cost prohibitive solution, this proposal also runs contrary to the Marine Aviation transition plan neck-down approach towards reducing the assortment of type/model/series aircraft in the inventory.

Course of Action Analysis

The final step in reevaluating the structure of the Y/Z equipped HML/A is providing a recommended course of action solution. Based on the information provided to this point, the following points should be apparent:

- The existing HML/A structure (PAA 18/9) merits a critical reevaluation to account for the increased capabilities of the modernized Huey and Cobra fighting an unknown adversary in an uncertain environment.
- The Y/Z mixed section synergy is the optimal core tactical element for the HML/A to build around in order to combat emerging threats by providing scalable, responsive, multi-capable options.
- Per unit cost of the UH-1Y is less than either the AH-1Z or the MV-22.

- Operating cost(fuel and MMPFH) of the UH-1Y is less than the MV-22.
- Future demand for the expanded scope Light Lift assault support regime increases future demand for UH-1Y sorties.
- Future economic and budgetary reality demands fiscally responsible solutions.

The prime constraint for a solution would be to operate within the current HML/A total asset and personnel numbers thereby avoiding any requirement to carve out additional manpower within the 202K expansion plan. Additionally, institutional improvements must take priority over parochial bias towards the status quo to get on message with the strategy plan outlined in the Commandant's *Vision and Strategy 2025*.

An initial assessment would suggest a 13Y/13Z squadron helicopter mix built around the core Y/Z section for all 10 operational squadrons. In this case, splitting the 67 pilot allocations to 32 for each series helicopter and re-directing four helicopter mechanic quotas to crew-chief billets to support the four additional Hueys on the flight line. This course of action reduces each HML/A by 1 aircraft and 3 pilots. The 30 officer billets saved could be returned to the overall Marine manpower force structure pool and the 10 aircraft would not be purchased, saving overall procurement funding of approximately 230 million in FY09 dollars. An additional significant cost savings would be realized when the now 339 H-1 total purchase contract ratio would change in favor of buying the less expensive UH-1Y. This solution supports 2 detachments of 4UH-1Ys/4AH-1Zs plus 1 detachment of 5UH-1Ys/5AH-1Zs for each HML/A. Yet, detachments comprised of only 4 UH-1Ys do not adequately cover excess capacity demand forecasted in the traditional lower end Medium Lift regime.

Conversely, the optimal mix would be an HML/A re-structured, manned, trained, and equipped around a 15Y/12Z helicopter makeup. This structure is optimal on several levels and has its basis in the 5Y/4Z detachment. Built around the core Y/Z section, this solution also provides

additional capacity for cost effective passenger and cargo movement in the future ACE. This course of action maximizes the HML/A force, while remaining within the constraint of not growing larger than the current HML/A total numbers. It provides for multiple sorties using the core Y/Z section, which best supports the talking points in the Commandant's *Vision and Strategy 2025* plan. Finally, by having additional UH-1Ys above the Y/Z 1:1 core ratio, this solution addresses the inevitable assault support demand spike for efficient, low-end Medium Lift when the MV-22 meets full operational capability.

At first glance, this proposal may draw concern from warfighters who perceive an unacceptable reduction in precision firepower when attack helicopter numbers are decreased. That observation is simply not correct in the current context. Recall that the AH-1Z is capable of doubling the ordnance carried by the AH-1W. The Y/Z section actually provides more firepower with increased weapons to target options than the current tactical employment strategy of pure AH-1W sections. Additionally, manning, equipping, and training to the more complex Y/Z core element does not restrict the squadron commander or a detachment flight leader from task organizing to best support a unique mission using purely UHs or AHs. To dismiss this proposed solution over a perceived loss of turf or firepower in the Cobra community is reprehensible in terms of putting personal sentiment over the nation's overall security needs, as well as disregarding the intent articulated in the Commandant's vision statement. Furthermore, the FY09 Aviation Campaign Plan puts considerable emphasis in and identifies substantial resources towards increasing Tier III UASs and KC-130J non-traditional-intelligence, surveillance, and reconnaissance precision delivery munitions kits, resulting in sizeable gains in other precision firepower for the future ACE.⁴⁶

Estimated cost savings to the 349 H-1 upgrades procurement program would be in excess of 350 million dollars when adjusting the Y to Z ratio to cover the 15Y/12Z HML/A structure. This

structure also provides a very simple solution to the projected Cobra inventory shortage and supports significant additional cost saving by canceling funding expenses for the “build new Z” project, which would no longer be a requirement. The current “W” Cobra inventory of 164 exceeds the estimated 153 total “Z” remanufacture requirement in the 15Y/12Z squadron plan.⁴⁷

The 67 pilots per unit would be broken down to 12 Y pilots and 9 Z pilots per each of the three 5Y/4Z detachments. See the lower portion of Appendix E for sortie generation considerations in a 5Y/4Z detachment. A full squadron would staff 38 Y and 29 Z pilots with the additional pilots accounting for command element leadership. To operate the additional Hueys, crew chief numbers would be increased from 19 to 25 through internal redistribution and reallocation of occupational specialties. Less attack helicopters requires fewer ordnance-men, as well as shifting the ratio of helicopter mechanics to favor more crew chiefs.⁴⁸ All intended changes would occur within the current HML/A structure numbers to have zero additional officer or enlisted manpower allocation increases thereby meeting the principle constraint.

Increasing UH-1Ys and decreasing AH-1Zs, coupled with pilot and aircrew occupational skills adjustments, would begin no earlier than FY2013 and would require no significant modifications to established support or training pipelines. The gradual ramp-up in producing more Y pilots and crew chiefs would correspond to an equal ramp-down in Z pilot and H-1 mechanic pipelines, avoiding requirements for model conversion flight training, as was seen in the early 1990s going from 12AH/12UH squadrons to 18AH/9UH squadrons.⁴⁹

Conclusion

This paper provided evidence to support the proposition for the Marine Corps to take an unbiased, critical look at the existing structure of the HML/A squadron to determine if the structure and the process used to build it are still valid formulas to achieve success as outlined in the CMC vision statement. The metrics and assumptions used to formulate the current HML/A construct

have changed considerably since 1991. With so many advantages inherent in the synergy of the modernized UH-1Y/AH-1Z team, consideration is due for reorganization of the unit reformed around the mixed section in order to best combat future threats with this multi-capable force. The disparate performance issues of the old UH-1N and AH-1W no longer exist in the Y/Z HML/A. No longer is mutual support compromised to accommodate aircraft limitations. The balance (i.e., complementary weapons, sensors, flight performance capabilities, and crew configurations that can address a wider range of situations or mission tasks) a Y/Z section contributes to supporting the MAGTF Commander across the six functions of Marine aviation is unmatched.

With the HML/A core element built around the well balanced Y/Z section, this structure offers significant opportunities to the Marine Expeditionary Unit Commander with a 5/4 HML/A detachment. The ACE Commander will not only be able to source multiple H-1 sections around the clock capable of executing every mission essential task required of an HML/A; but, there will also be access to additional assault support sorties historically flown by the CH-46E. For the larger MAGTFs, the Commander will have a well-balanced HML/A squadron capable of task organizing down to the section level to provide flexible, adaptive, and responsive support across all six functions of Marine Aviation. For all these reasons, now is the time to reevaluate the current position and the core structure for the HML/A.

As a result of the background details provided and this in depth analysis, a clear requirement for HML/A force structure review exists. Immediate action must be taken to posture the future HML/A as a seamless team. A team capitalizing on the technological gains made in the modernized UH-1Y and AH-1Z section that is trained and equipped to perform with the multi-mission capable mindset expected in tomorrow's warfighters.

Notes

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APPENDIX A H-1 MISSION ESSENTIAL TASK LISTS

UH-1 Huey

- a. (UJTL TA 1.1.2) Conduct Shipboard Deck helicopter Landing Qualifications.
- b. (UJTL TA 1.1.4) Conduct Sea and Air Deployment Operations
 - Maintain the capability to deploy and operate from advanced bases, expeditionary airfields, Forward Operating Bases (FOBs), and naval shipping.
 - Perform organizational maintenance on assigned aircraft.
- c. (UJTL TA 1.2.1) Conduct Air Assault Operations and Air Assault
 - **Provided assault support transport of combat troops.**
 - **Provide support for casualty evacuation operations.**
 - Provide armed escort for assault helicopters.
- d. (UJTL TA 1.2.3) Conduct Amphibious Assault and Raid Operations
 - **Conduct assault support for maritime special operations.**
 - Provide armed escort for airborne and surface forces.
- e. (UJTL TA 3.2.1) Conduct Fire Support
 - Provide fire support for forward and rear area forces against point and area targets.
- f. (UJTL TA 3.2.2) Conduct Close Air Support
 - Conduct escort of friendly ground forces.
 - Conduct Assault Support Escort.
- g. (UJTL TA 3.2.3) Conduct Interdiction Operations
 - Conduct Armed reconnaissance.
- h. (UJTL TA 3.2.8) Conduct Air-to-Air Operations
 - Maintain self-defense capability from air-to-air threats.
- i. (UJTL TA 3.3) Coordinate Battlespace Maneuver and Integrate w/ Firepower
 - Conduct combined arms coordination and control operations.
 - **Provide airborne command, control and coordination for assault support operations.**
 - Conduct multi-sensor imagery, visual reconnaissance, and provide Battle Damage Assessment.
- j. (UJTL TA 6.2) Conduct Joint Personnel Recovery
 - Conduct Tactical Recovery of Aircraft and Personnel (TRAP) operations.
 - **Augment local Search and Rescue (SAR) assets.**
- k. (UJTL TA 6.3) Conduct Rear Area Security
 - Provide fire support and security for rear area forces.
- l. (UJTL TA 6.4) Conduct Noncombatant Evacuation
 - Provide Fire Support and escort for evacuation operations.
 - **Provide support for evacuation operations.**

AH-1 Cobra

- a. (UJTL TA 1.1.2) Conduct Shipboard Deck helicopter Landing Qualifications.
- b. (UJTL TA 1.1.4) Conduct Sea and Air Deployment Operations
 - Maintain the capability to deploy and operate from advanced bases, expeditionary airfields, Forward Operating Bases (FOBs), and naval shipping.
 - Perform organizational maintenance on assigned aircraft.
- c. (UJTL TA 1.2.1) Conduct Air Assault Operations and Air Assault
 - Provide armed escort for assault helicopters.
- d. (UJTL TA 1.2.3) Conduct Amphibious Assault and Raid Operations
 - Provide armed escort for airborne and surface forces.
- e. (UJTL TA 3.2.1) Conduct Fire Support
 - **Engage and destroy point armored targets.**
 - Provide fire support for forward and rear area forces against point and area targets.
- f. (UJTL TA 3.2.2) Conduct Close Air Support
 - Conduct escort of friendly ground forces.
 - Conduct Assault Support Escort.
- g. (UJTL TA 3.2.3) Conduct Interdiction Operations
 - Conduct Armed Reconnaissance.
- h. (UJTL TA 3.2.4) **Conduct Joint Suppression of Enemy Air Defenses**
- i. (UJTL TA 3.2.8) Conduct Air-to-Air Operations
 - **Conduct offensive anti-air warfare and defensive air operations.**
 - Maintain self-defense capability from air-to-air threats.
- j. (UJTL TA 3.3) Coordinate Battlespace Maneuver and Integrate w/ Firepower
 - Conduct combined arms coordination and control operations.
 - Conduct multi-sensor imagery, visual reconnaissance, and provide Battle Damage Assessment.
- k. (UJTL TA 6.2) Conduct Joint Personnel Recovery
 - Conduct Tactical Recovery of Aircraft and Personnel (TRAP) operations.
- l. (UJTL TA 6.3) Conduct Rear Area Security
 - Provide security for forward and rear area forces against point/anti-armor forces.
- m. (UJTL TA 6.4) Conduct Noncombatant Evacuation
 - Provide Fire Support and escort for evacuation operations.

UH-1Y Huey Fact Sheet

MISSION: The UH-1Y utility helicopter provides rotary wing close air support, armed escort, armed/visual reconnaissance, assault support and fire support coordination capabilities under day/night and adverse weather conditions for the U.S. Marine Corps.



SUMMARY: The UH-1Y is the most significant upgrade ever made to the venerable and battle-proven H-1 helicopter. At the heart of the upgrade is a new four-bladed, all-composite and ballistically tolerant (up to 23 mm) rotor system. Upgraded engines and transmissions, integrated digital cockpit featuring multifunction flat panels, increased payload capabilities, crash-worthy seating for all crew and passengers, and 84 percent identical parts with the AH-1Z Super Cobra (also part of the H-1 Upgrade Program) also provide increased load carrying ability, greater range and survivability, smaller logistical footprint and easier maintenance for the Marine Corps.

STATISTICS:

Fuselage Length	44 feet
Overall Length	58 feet
Height	17 feet
Weight	11,839 lbs (empty), 18,500 lbs (max gross)
Speed	198 knots (max), 135 knots (cruise)
Ceiling	20,000 feet
Range	130 Nautical Miles (Mission Radius w/combat load)
Power Plant	2 General Electric T-700-GE-401C turboshaft engines
Sensor	FLIR Systems, Inc. STAR SAFIRE or BRITE STAR
Crew	Pilot, copilot, crew chief, gunner plus 8 combat-equipped troops
Contractor	Bell Helicopter-Textron

Huey Comparison:

	<u>UH-1N</u>	<u>UH-1Y</u>	<u>Improvement</u>
Max Gross Weight	10,500 lbs	18,500 lbs	76 percent
Max. Internal Fuel	1,360 lbs	2,584 lbs	90 percent
Maximum speed	130 kts	198 kts	52 percent
Cruise speed	107 kts	153 kts	43 percent
HOGUE Useful Load (SL/Hot)	3,532 lbs	5,930 lbs	68 percent
Service ceiling	17,300 feet	20,000 feet	16 percent
Mission Radius*	N/A	130 nm	N/A

*Mission: 8 troops w/equipment, 30-min on station, 20-min fuel reserve, mid-mission HOGUE

APPENDIX C

AH-1Z Cobra Fact Sheet

MISSION: The AH-1Z attack helicopter provides rotary wing close air support, anti-armor, armed escort, armed/visual reconnaissance and fire support coordination capabilities under day/night and adverse weather conditions for the U.S. Marine Corps.



SUMMARY:

The Marine Corps' is replacing the two-bladed AH-1W with the AH-1Z, which features a new, four-bladed composite rotor system, performance-matched transmission, four-bladed tail rotor, upgraded landing gear and a fully integrated glass cockpit. The commonality gained between the AH-1Z and the UH-1Y (approximately 84 percent) is expected to significantly reduce life-cycle costs and the aircraft's logistical footprint, while increasing the maintainability and deployability.

Two AH-1Z aircraft completed Operational Evaluation Phase One in January 2007; an additional AH-1Z operational evaluation period is scheduled for 2010. IOC for the AH-1Z is projected to be fiscal year 2011.

STATISTIC: AH-1Z data

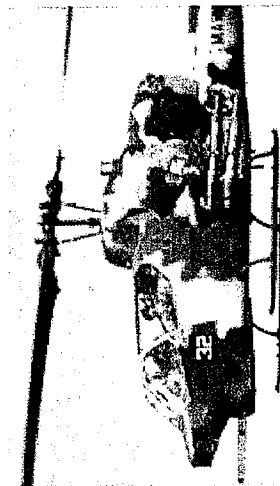
Fuselage Length	44 feet
Overall Length	58 feet
Height	17 feet
Weight	12,300 lbs (empty), 18,500 lbs (max gross)
Speed*	222 knots (max), 134 knots (cruise)
Ceiling*	20,000+ feet
Range*	125 Nautical Miles (Mission radius w./ combat load)
Power Plant	2 GE T700-GE-401 turboshaft engines
Sensor	Lockheed Martin Target Sighting System (TSS)
Crew	2
Contractor	Bell Helicopter-Textron

Cobra Comparison:

	AH-1W	AH-1Z	Improvement
Max Gross Weight	14,750 lbs	18,500 lbs	25 percent
Max. Internal Fuel	2,100 lbs	2,768 lbs	32 percent
Maximum speed	190 kts	222 kts	17 percent
Cruise speed	131 kts	142 kts	8 percent
Service ceiling	14,700 feet	20,000 feet	36 percent
Mission Radius*	58 nm	128 nm	121 percent

**Mission: 8 Hellfire, 14 rockets, 30 min on station, 20 min fuel reserve*

APPENDIX D H-1 Evolution



AH-1J



AH-1G

AH-1T

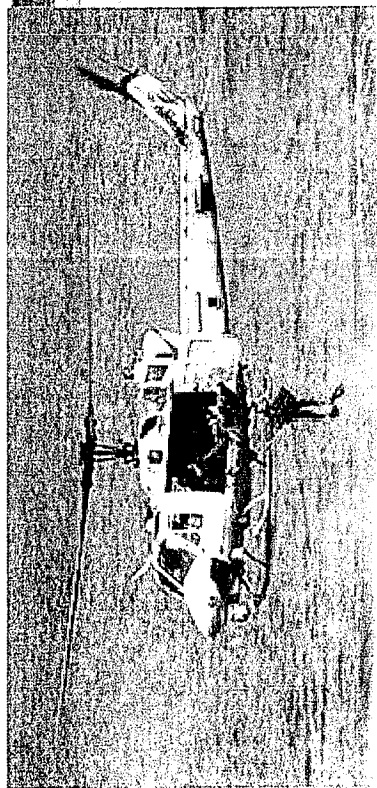
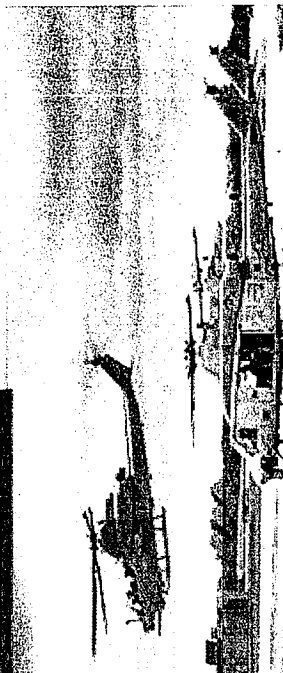


AH-1W



UH-1E

AH-1Z



UH-1N

UH-1Y



1968

2009

APPENDIX E

HML/A Sortie Generation Rates

Existing HML/A sortie requirements achieved with 18W/9N PAA

HML/A Core Capable Squadrons are expected to maintain 70% mission capable aircraft producing 30 AH-1W sorties and 15 UH-1N sorties within a 24-hour period. Or, three times HML/A detachment rates.

AH-1W Cobra Detachment 6 Cobras & 14 pilots	UH-1N Huey Detachment 3 Hueys & 7 pilots
- Mission Readiness rate 70% x 6 \approx 4 AH-1Ws not requiring maintenance and available to be scheduled to fly missions	- Mission Readiness rate of 70% x 3 \approx 2 UH-1Ns not requiring maintenance and available to be scheduled to fly missions
- 4 Cobras fly 10 sorties every 24 hours	- 2 Hueys fly 5 sorties every 24 hours
8 pilots/4 helicopters scheduled to fly two missions in a 12 hour period + 4 pilots /2 of those same 4 helicopters scheduled to fly one mission in a subsequent 12 hour period.	4 pilots/2 helicopters scheduled to fly two missions in a 12 hour period + 2 pilots and 1 of those same 2 helicopters scheduled to fly one mission in a subsequent 12 hour period.

HML/A sortie demands achieved proposing a 15Y/12Z PAA

H-1 Upgrade Program of Record requirement of 80% readiness rating supports HML/A Core Capable Squadrons producing 51 sustained sorties within a 24 hour period. Or, three times that of a 5Y/4Z HML/A detachment.

HML/A (Mixed Section as the core element) Detachment 5 Hueys & 12 pilots + 4 Cobras & 9 pilots
- Mission Readiness rate of 80% \approx 7 H-1s not requiring maintenance and available to be scheduled to fly missions \approx 4 Hueys fly 12 sorties every 24 hours + 3 Cobras fly 8 sorties every 24 hours
Task organize to weight the main effort or to evenly balance around the clock coverage
1 st 12 hours – 12 skid pilots scheduled for 3 mixed sections twice + 2 Y pilots scheduled for 1 Huey twice = 14 sorties
2 nd 12 hours – 4 skid pilots scheduled for 1 mixed section once + 2 Y pilots scheduled for 1 Huey once = 3 sorties
1 st 12 hours – 8 skid pilots scheduled for 2 mixed sections twice + 2 Y pilots scheduled for 1 Huey twice = 10 sorties
2 nd 12 hours – 8 skid pilots scheduled for 2 mixed section twice + 2 Y pilots scheduled for 1 Huey twice = 10 sorties

The 15Y/12Z structure best supports the forecast demand spike in low end (1-3k lbs / 1-8 pax) assault support requirements being filled by the “Y” as a fiscally viable preference over the MV-22 in low-density/high-demand assault support missions. “Best,” in this context is defined as optimizing the UH-1Y quantity to meet the demand spike while remaining within the authorized personnel and total aircraft end strength of the current HML/A – 27 airframes, 67 pilots and ~350 maintenance personnel.

APPENDIX F

Y/Z Team and the Six Functions of Marine Aviation

1. Air Reconnaissance – complementary weapons, sensors and crew configurations provide optimal survivability while conducting air reconnaissance. The fire power strength of the Z combined with the Y's four man crew and highly responsive near 360 weapons coverage provides best all-around weapons and visual coverage compared to pure Y or pure Z sections. This function is simply observing and reporting what is on the battlefield. The Y/Z team conducting this mission still has the inherent flexibility to complete any of the 23 other items in the combined mission task list.
2. Anti-Air warfare – a discreet function required in conventional warfare against the select few well-equipped adversaries posing a threat to local air superiority. The Y/Z section has a reduced Sidewinder missile quantity when compared to pure "Z" section making it less lethal in an extended air-to-air engagement with multiple bandits. The Y/Z section carries an advantage in better all around lookout coverage improving survivability through early visual detection. Additionally, the mixed section supports an option of carrying a complete Sidewinder reload quantity and an ordnance crew to perform a hasty, field expedient reload for the "Z" if the quantities of bandit aircraft warrants such actions during a purely offensive anti-air mission.
3. Control of Aircraft and Missiles – the HML/A's role is twofold for this function through its specified mission of airborne supporting arms coordination. First, both Y and Z crews are trained in Forward Air Controller (Airborne) missions. The Y/Z team provides the optimal mix for either dedicated or incidental FAC(A) missions given the complementary weapons, sensors, communications and configurations. Secondly, the Command & Control task by the "Y" executed with a "Z" wingman increases survivability through mutual support for this

APPENDIX F

Y/Z Team and the Six Functions of Marine Aviation

high value asset while the commander is embarked. This same logic applies to a “Y”

performing duties as a Tactical Air Coordinator (Airborne) (TAC(A)).

4. Electronic Warfare – a Y/Z section contributing to this function focuses primarily on the assault support function by carrying personnel or specialized equipment in the cabin of the “Y” conducting electronic attack, deception, or collections ideally with the “Z” providing mutual mixed section support and serve as an escort.
5. Offensive Air Support – the multicapable Y/Z section provides a wider variety of firepower applications for the greatest number of scenarios, “in an uncertain environment and against irregular threats” as covered in the Commandant’s *Vision and Strategy 2025*.¹ Rightsizing the force by organizing the HML/A around the core Y/Z team best meets the H-1 requirements for the Security Cooperation MAGTF, the irregular warfare scenarios and the low intensity conflict where an enemy air threat is non-existent and air superiority is unopposed. These threat scenarios form the vast majority of likely conflicts on the horizon and are the model situations to have a two fisted fighter a radio call away. The author fully concedes to a pure “Z” section, vice Y/Z section, providing the largest quantity in PGM firepower when calculating kill capabilities against armored or airborne targets and it carries the preferred standoff weapon for high value precision strike. Certainly, during those limited situations when going heavy kinetic with preplanned precision fires in high volume are required, the Y/Z section may not be ideal. Nevertheless, when significant PGM quantity is not the principle factor, which is the dominate theme for future threats, the mutual support, scalable weapons response options, and survivability offered within the Y/Z section, especially in and around urban sprawl, far outweighs the PGM capacity advantage of the pure Z section.

APPENDIX F

Y/Z Team and the Six Functions of Marine Aviation

One final point under Offensive Air Support is this, the Commandant's strategy calls for preparing to fight the hybrid conflict while maintaining the current conventional capability. The Y/Z section exceeds the current AH-1W section conventional ordnance load out while flying further and faster.² An AH-1Z section doubles the conventional warfare capability when compared to the existing AH-1W section. So earnestly meeting the vision and strategy does not demand an equal number of AH-1Zs to maintain current conventional capabilities within the HML/A.

6. Assault Support – The Y/Z section is able to perform five (combat assault transport, aerial delivery, air evacuation, Tactical Recovery of Aircraft and Personnel (TRAP), and battlefield illumination) of the seven types of assault support capitalizing on its internal assault support and escort/firepower capacity.³ A disadvantage in a Y/Z section dedicated to assault support is in the reduced lift from a single “Y” when compared to a pure Y section. In the two “Y” assault support lift scenario, this is where the HML/A flexibility to task organize shines. Two mixed sections have the option to join forces to complete the mission as a four ship – two Ys performing the assault support while being escorted by two Zs. Alternatively, the two separate Y/Z elements could coordinate but execute independently providing a degree of force protection to each element and deception to the adversary. This scalable concept applies to a large variety of scenarios where a situation's restraints and constraints make the characteristics of the UH-1Y a suitable platform for execution.

Assault Support Escort ties directly to the Assault Support function, falls directly in line with the HML/A squadron mission statement/aircraft METLs, and includes six separate tasks which cross the overarching six functions boundaries: Protection from Enemy Ground Fire, Route Reconnaissance, Clear the Landing Zone by Fire, Support of a Downed Helicopter,

APPENDIX F

Y/Z Team and the Six Functions of Marine Aviation

Protection from a Fixed-Wing Threat and Protection From a Rotary-Wing Threat. The three tactical variations to employ escort are by either attaching to the assault flight, remaining detached from the assault flight or a combination derivative performing these six missions in regions of greatest threat to the assault support assets.

The complementary Y/Z team is highly effective, efficient and versatile in accomplishing these six escort missions. The team is no longer handicapped by the old UH-1N's airspeed limitation which was the principle detractor for Hueys to conduct assault support escort. Anti-armor or anti-air missile quantity advantages in a pure "Z" section over the Y/Z team during any of these missions are conceded. These advantages dominate during attached escort reactionary engagements protecting the assault flight against well equipped enemy states or extremely well funded non-state adversaries possessing armor or aviation assets. However, attached assault support escort using helicopters is no longer as viable a tactic for the vast majority of the Marine Corps' assault support force – MV-22.

Overall Marine Aviation demand for H-1 attached escort reduces by more than 50% the sorties required during Osprey operations. Yet, the demand in detached escort from H-1s will not see an equivalent rise because detached escort focuses on endurance, or time-on-station, factors. To illustrate this difference, assume three waves of lift are required to either insert or extract a ground unit. Conducting this mission using CH-46Es, several elements of attached escort helicopters would flow in and out of the objective area with each wave performing all six missions of escort during the entire transit and objective area space. Contrast this with MV-22 detached escort profiles requiring the escort helicopters to remain oriented around the highest threat region executing those six escort missions for the duration of critical exposure. Restricting MV-22s to fly at H-1s speeds is tactically unsound and

APPENDIX F

Y/Z Team and the Six Functions of Marine Aviation

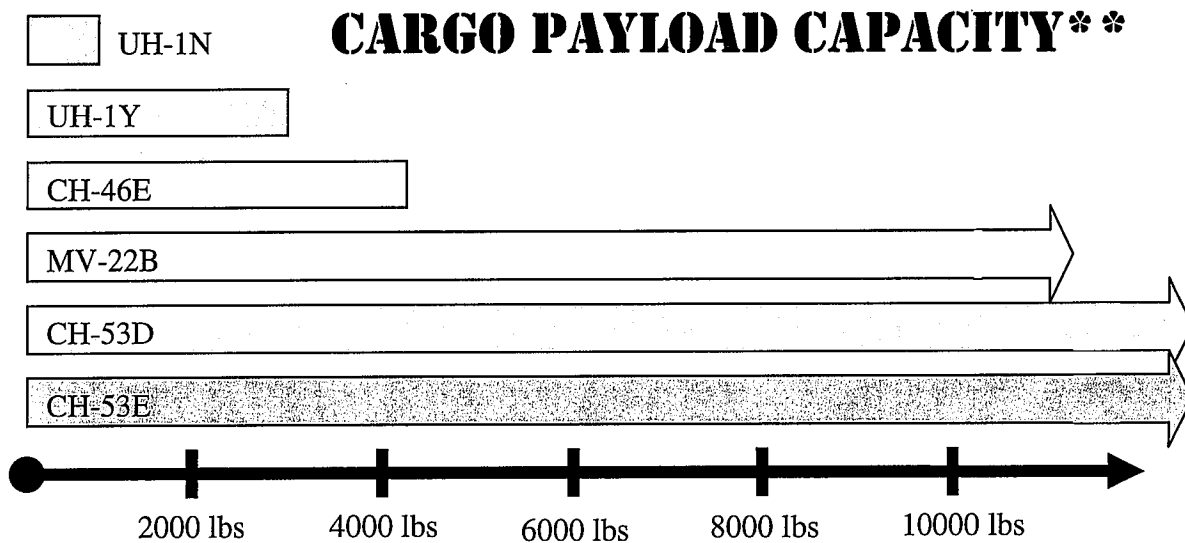
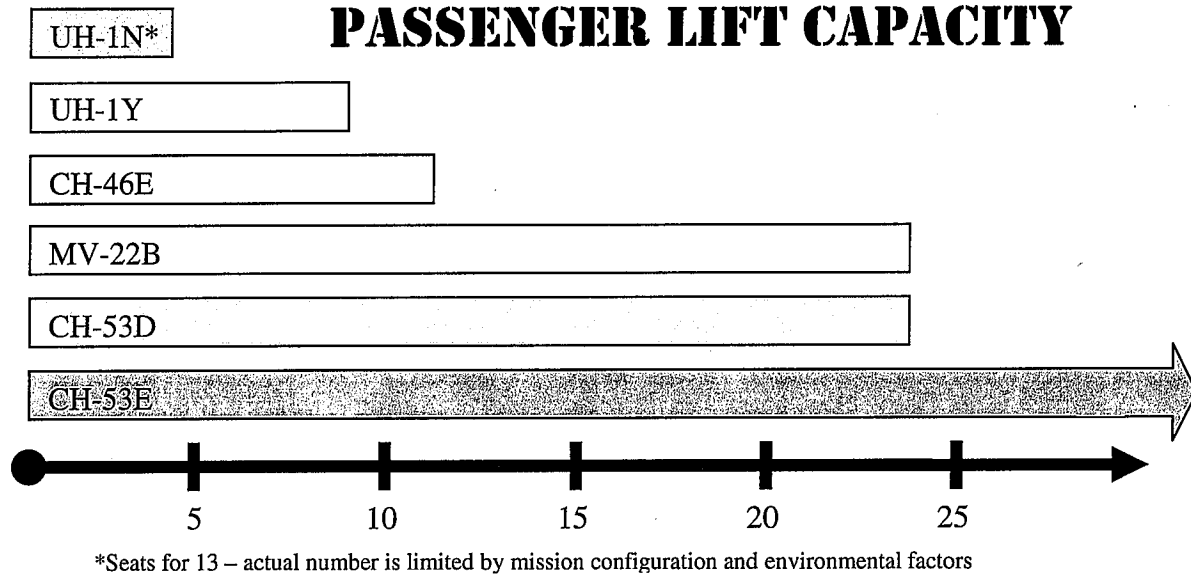
negates the principle reason for their procurement. What has proven tactically sound and operationally successful has been placing responsive, scalable H-1 firepower in close proximity to the highest potential threat areas with endurance capacity to account for mission duration plus delays. The Y/Z future attached escort mission will primarily provide cover to CH-53E movements and both H-1s can match the speed of the Super Stallion. The point, the UH-1Y teamed up with the AH-1Z is a tactically sound assault support escort team and accomplishes the six missions of assault support escort.

¹ Headquarters, U. S. Marine Corps, *Vision & Strategy 2025*, (Washington, DC: Headquarters, U.S. Marine Corps, June 18, 2008), 9.

² Scott Atwood, interview with author, December 8, 2008.

³ Headquarters U.S. Marine Corps. *Assault Support*, MCWP 3-24 (Washington, DC: U.S. Marine Corps, May 20, 2004), 1-2.

APPENDIX G
Nominal Assault Support Coverage



**Actual cargo payload limited by mission configuration and environmental factors

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